

REMARKS

Claims 1-3, 6-8, 10, 13-15, 17, and 19-20, all the claims pending in the application, stand rejected on prior art grounds. Applicants respectfully traverse these rejections based on the following discussion.

I. The Prior Art Rejections

Claims 1-3, 6-8, 10, 13-15, 17, and 19-20 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Fuji (U.S. Patent No. 5,574,280), in view of Kadyshevitch (U.S. Publication No. 2004/0021076). Applicants respectfully traverse these rejections based on the following discussion.

The claimed invention provides a method of inspecting topographical features of the top layer of a structure. In the rejection, the Office Action argues that the prior art of record discloses many features of the claimed invention. However, because the secondary electrons of Kadyshevitch “are driven down toward the bottom of the holes”, they are not free to react with any precursor gas to form any metal coating. Therefore, as explained in greater detail below, Applicants respectfully submit that the prior art of record does not teach or suggest the claimed invention.

The Office Action expressly acknowledges that “Fuji fails to teach directing an angled electron beam at the structure ... where an angle of said angled beam is selected to create secondary electron beams as said angled electron beam strikes sidewalls of said topographical features, comprising directing said electron beam at an angle sufficient to cause said electron beam to strike the sidewalls of said topographical features and prevent

said electron beam from reaching the bottom of said topographical features” (Office Action, pp. 3-4, item 6) (independent claims 1, 8, 15).

However, the Office Action asserts that Kadyshevitch teaches an angled electron beam 130, wherein “the tilt angle of beam 130 is preferably chosen so that a majority of primary beam electrons do not strike the bottom of the contact hole” (Office Action, p. 4, item 7). Nevertheless, Applicants submit that the proposed combination of Fuji and Kadyshevitch would not have resulted in the claimed invention because the electron beam of Kadyshevitch does not create secondary electron beams that “break down said precursor metal gas to form a metal coating” (independent claims 1, 8, 15). The secondary electrons of Kadyshevitch are directed to the bottom of the holes after striking the sides and are not free to react with any precursor gas.

Nothing within Kadyshevitch mentions secondary electron beams that “break down said precursor metal gas to form a metal coating” (independent claims 1, 8, 15). Instead, Kadyshevitch only discloses the use of secondary electron beams to “provide a more sensitive indicator of etch state” in a specimen.

More specifically, as described in paragraph 0017 of Kadyshevitch, test configurations are used to enhance the strength or sensitivity of the etch indicator signal for a given particle beam current and contact hole size. These test configurations are useful in particular to enhance sensitivity to very thin layers or remaining dielectric at the bottom of the contact hole. In one of these embodiments, the particle beam irradiates the surface of the sample at a non-normal angle, i.e., with at least a slight tilt. As a result, the energetic primary beam strikes the side walls of the contact holes, rather than the bottom.

The surface of the sample is negatively precharged, so that **secondary electrons** emitted from the side walls and upper edge of the contact holes **are driven down toward the bottom of the holes**. The secondary electrons, however, are substantially less energetic than the electrons in the primary beam. Therefore, the secondary electrons are less able than the primary electrons to penetrate through thin residue layers that may remain at the bottom of the contact holes. As a result, the measurement of specimen current using an angled particle beam can, under some conditions, provide a more sensitive indicator of etch state than can be achieved using a conventional, normal-incidence beam.

Because the “secondary electrons ... are driven down toward the bottom of the holes” (Kadyshevitch, para. 0017), they are not free to react with any precursor gas (such as that in Fuji) to form any metal coating. Therefore, Applicants submit that Kadyshevitch teaches away from the claimed invention.

To the contrary, as described in paragraph 0027 of Applicants’ disclosure, the invention surrounds the partially completed integrated circuit structure 100 with a precursor organic metal gas 108 and then directs an angled electron beam 110, from an ion beam generator 46, to the partially completed integrated circuit structure 100 to create secondary electron beams 604 (shown in FIG. 6) as the angled electron beam 110 strikes the sidewalls of the vias 104. The process of directing the angled electron beam can be performed for example, by tilting the stage 26 that supports the partially completed integrated circuit structure 100.

As further described in paragraph 0028 of Applicants’ disclosure, the secondary electron beams 604 break down the precursor metal gas to form a metal coating 112,

without damaging the top layer 102 (or underlying layers 100). This process directs the electron beam 110 at an angle sufficient to cause the electron beam 110 to strike only the sidewalls of the vias 104 and prevent the electron beam 110 from reaching the bottom of the vias 104, so as to not damage the vias 104 during the metal formation process. The primary electron beam 110 does not substantially affect the sidewalls of features and can readily be directed at such sidewalls. Instead, the primary beam should be kept away from the bottom and lower level features, such as the ARC, to prevent damaging such lower level substances.

Accordingly, Applicants submit that because the secondary electrons of Kadyshevitch “are driven down toward the bottom of the holes”, they are not free to react with any precursor gas to form any metal coating. Therefore, it is Applicants’ position that the proposed combination of Kadyshevitch and Fuji does not teach or suggest the claimed features of directing said electron beam at an angle sufficient to cause said electron beam to strike the sidewalls of said topographical features and prevent said electron beam from reaching the bottom of said topographical features, wherein said secondary electron beams break down said precursor metal gas to form a metal coating on said structure as defined in independent claims 1, 8, and 15.

Therefore, it is Applicants’ position that the prior art of record does not teach or suggest many features defined by independent claims 1, 8, 15 and that such claims are patentable over the prior art of record. Further, it is Applicants’ position that dependent claims 2-3, 6-7, 10, 13-14, 17, and 19-20 are similarly patentable, not only because of their dependency from a patentable independent claims, but also because of the additional

features of the invention they defined. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

II. Formal Matters and Conclusion

In view of the foregoing, Applicants submit that claims 1-3, 6-8, 10, 13-15, 17, and 19-20, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary. Please charge any deficiencies and credit any overpayments to Attorney's Deposit Account Number 09-0458.

Respectfully submitted,

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